

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 10, 15, 16, and 17 are currently being amended. Claims 14 and 21 are cancelled without prejudice. No new matter is added.

This amendment changes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-4 and 6-23 are now pending in this application.

Claim Rejections under 35 U.S.C. 103

Claims 1-4 and 6-8:

In paragraph 3 of the Office Action, Claims 1-4 and 6-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,030,895 (“Joshi”) in view of U.S. Patent No. 6,339,496 (“Edelstein”), and U.S. Patent No. 6,440,849 (“Merchant”). Applicants respectfully traverse rejection.

Claims 1-4 and 6-8 all require:

depositing a copper alloy via material in the via aperture to form a via, the copper alloy material including Zinc (Zn) or Silver (Ag) and at least one element **for increasing grain size** including Calcium (Ca) or Chromium (Cr).

On page 3 of the Office Action, the Examiner states:

Neither Joshi et al. nor Edelstein et al. disclose that Cr additions to the copper alloy increase and subsequently stabilize the grain size.

Merchant et al. disclose that Cr additions to the copper produce an initial increase and subsequent stabilization of grain size (Col. 2, lines 8-15). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Merchant et al. and Edelstein et al. with Joshi et al. ...

(emphasis added.) Applicants respectfully disagree. Merchant et al. Col. 2, lines 8-15 states:

A method of making an integrated circuit having copper interconnects comprises alloying the copper of the interconnect with one or more elements which can **control and maintain the grain size and grain boundaries of the copper**, without significant loss of electrical properties, said alloying elements being present in an amount less than that which creates a second phase or precipitate within the alloy, at least at the annealing temperature.

(emphasis added.) Indeed, Merchant et al. does **not** disclose increasing the grain size, but rather only describes “controlling” and “maintaining” the grain size. *No where* in Merchant et al. is there any mention of “increase” or “increasing” the grain size.

Accordingly, the rejection of Claims 1-4 and 6-8 under 35 U.S.C. § 103(a) based on Joshi, Edelstein, and Merchant cannot be properly maintained. Applicants respectfully request withdrawal of the rejection.

Claims 10-16:

In paragraph 12 of the Office Action, Claims 10-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,090,170 (“Andricacos”) in view of Merchant et al. Applicants respectfully traverse the rejection.

Claim 10 has been amended to include dependent claim 14. Claim 10 now recites:

the ternary copper alloy via material includes an element with a characteristic for **increasing grain size** of the ternary copper alloy via;

As mentioned previously, on page 3 of the Office Action, the Examiner states that “Neither Joshi et al. nor Edelstein et al. disclose that Cr additions to the copper allow increase and subsequently stabilize the grain size.” Applicants agree.

However, as indicated with respect to the rejection of Claims 1-4 and 6-8, the Examiner posits that “Merchant et al. disclose that Cr additions to the copper produce an initial increase and subsequent stabilization of grain size (Col. 2, lines 8-15).” Applicants respectfully disagree. As discussed in response to the rejection of Claims 1-4 and 6-8, Merchant et al. does not disclose or mention increasing the grain size. Instead, Merchant et al. only discusses maintaining and controlling the grain size.

Thus, the rejection of Claims 10-13 under 35 U.S.C. § 103(a) based on Andricacos in view of Merchant et al. cannot be properly maintained. Applicants respectfully request withdrawal of the rejection.

Claims 17-23:

In paragraph 17 of the Office Action, Claims 17-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Joshi et al. in view of Edelstein. In paragraph 20 of the Office Action, Claims 21-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Joshi et al. in view of Edelstein in view of Merchant et al. In paragraph 23 of the Office Action, Claim 23 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Joshi et al. in view of Edelstein and in view of Gross. Applicants respectfully traverse the rejections.

Claim 17 has been amended to include Claim 21. Claim 17 now recites:

wherein the ternary copper alloy via material includes an element with a characteristic for **increasing grain size** of the ternary copper alloy via

Claims 18-20 and 22-23 depend from Claim 17. Claim 21 has been cancelled. As discussed above with respect to the rejections of the other pending claims, the Examiner admits

that Joshi et al. and Edelstein do not teach increasing the grain size. Further, Applicant has shown that Merchant et al. does not teach increasing the grain size. Indeed, the Summary of the Invention in Merchant et al. states simply: "We now provide a method and structure to substantially eliminate the grain growth of copper." (Col. 1, lines 66-67, emphasis added.) Clearly, Merchant et al. does not teach Applicants' claimed invention as recited in Claims 17-20 and 21-23. Applicants respectfully request withdrawal of the rejections of Claims 17-20 and 21-23.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

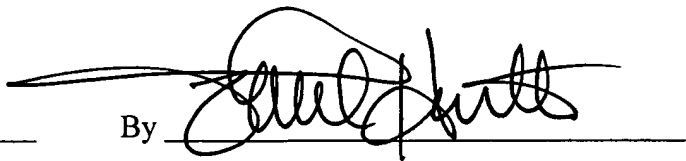
The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application. The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 50-2350. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 50-2350. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 50-2350.

Respectfully submitted,

Date

25 JUNE 2004

By



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